REMARKS

The Applicant thanks the Examiner for the helpful telephone interview of April 24, 2007, in which independent Claim 16 was discussed in view of the cited references. Claims 16 and 47 have been amended in view of comments by the Examiner.

Status of Claims

Claims 1-62 are pending in the application. In the Office Action made final at hand, Claims 1-15 and 32-46 are withdrawn from consideration, and Claims 16-31 and 47-62 are rejected.

Advantage of Applicants' Claimed Invention

Applicants' claimed invention has many advantages. Referring to Figs. 4-6, in one example of an embodiment in the present invention, the hollow lens 28 is substantially spherical, and can be a hyperspheroid lens. The hollow lens can have a substantially spherical interior portion and an outer surface bulging forward along its optical axis relative to the substantially spherical interior portion. The hyperspheroid lens can have optics which allow it to be about a ¾ sphere, and can make the hollow lens 28 compact in size. The hollow lens 28 can have spherically shaped inner and outer surfaces with centers offset from each other, as claimed in Claims 20 and 51, as amended. Offset centers can bulge the outer surface slightly forward relative to the inner surface along the optical axis. The light source 24a can be extended within the substantially spherical interior portion of the hyperspheroid hollow lens 28. The hyperspheroid hollow lens 28 can collect or shape light that is emitted from the light source in a hemisphere pattern, and direct the light in a beam towards LCD 34 in an efficient manner with minimal loss of light. As a result, the brightness of the projected images can be maximized, or alternatively, the power of the light source can be minimized. The location of the light source can be moved behind the optical center of the lens to form a desired beam. A hyperspheroid hollow lens that is about ¾ sphere can provide the desired optical characteristics while also having a relatively large circular bottom rim 48 (FIG. 6) which can provide stable mounting for the hollow lens 28 (FIG. 5). The relatively large circular bottom rim 48 of such a hyperspheroid hollow lens also allows the insertion of a light source that can extend across a majority of the

width of the interior of the hollow lens, for example as seen in FIG. 5. As a result, the hollow lens 28 and light source assembly can be compact, relative to the size of the light source, and can allow the display system to be more compact. Insertion of the light source within hollow lens 28 instead of behind a solid lens can also provide size benefits.

Amendments to Claims

Claims 16 and 47 have been amended to recite "a hyperspheroid hollow lens having an optical axis", and "the hollow lens having a substantially spherical interior portion and an outer surface bulging forward along the optical axis relative to the substantially spherical interior portion." Claim 16, as amended, recites a display system including a display device for providing images, where a first light source emits light, and a first light collection lens system has a hyperspheroid hollow lens with an optical axis. The hollow lens is for collecting the light emitted from the first light source and directing the light in a first beam of light to the display device for illuminating the images on the display device for viewing. The hollow lens has a substantially spherical interior portion and an outer surface bulging forward along the optical axis relative to the substantially spherical interior portion. The first light source is extended within the substantially spherical interior portion. Claim 47, as amended, is a method claim that generally parallels Claim 16, as amended.

In addition, Claims 20 and 51 have been amended to recite spherically shaped inner and outer surfaces with centers offset from each other.

Support for these amendments is found at least in Figs. 4-8, as well as on page 7, line 19 through page 8, line 5 of the Specification as originally filed. The Applicant points out that in the claim listing in the previous Amendment that was mailed December 5, 2006, the term "beams splitter" in Claim 61 was a typographical error and should have been "beam splitter" as was originally filed. Since this typographical error to Claim 61 was introduced without any amendment, the typographical error has been corrected. It is not believed that an amendment is required. No new matter is introduced.

Rejection of Claims Under 35 U.S.C. §103(a)

Claims 16-23 and 47-54 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Son (US 5,917,459) in view of Sakata (US 6,945,652) and Tarsa (US 6,350,041). In addition,

Claims 24-31 and 55-62 are rejected under Section 103(a) as being unpatentable over Son, Sakata and Tarsa, in view of Hirata (US 6,894,729). In response to the Section 103 rejections, the Applicant respectfully submits that Claims 16-31 and 47-62, as amended, are not obvious in view of Son, Sakata, Tarsa and Hirata. Reconsideration is respectfully requested.

Son discloses in Fig. 3, a holographic display 300 in which light from a light source 11 is directed to an information display 13 through a collimator 12. Images on the information display 13 are projected onto a reflection type holographic combiner 14 via a relay optical system 2 and a reflection mirror 3. Son does not have a hollow lens, such as a hollow hyperspheroidal hollow lens as in the claimed invention.

Sakata discloses in Fig. 9 a projection system having red 91a, green 91b and blue 91c LEDs. As with Son, Sakata does not have a hollow lens, such as a hollow hyperspheroidal hollow lens as in the claimed invention.

Tarsa discloses in FIG. 6b, a full spherical enclosure 63 surrounding a narrow elongate light source which extends into the enclosure 63 through a small opening. The spherical enclosure 63 has a width that is about 8 times greater than the width of the light source, is mounted to the stem of the light source, and does not make an efficient use of space. The enclosure 63 is shown with constant wall thickness. Consequently, there is no bulging of the outer surface forward along the optical axis relative to the inner surface. In addition, the inner and outer surfaces of the enclosure 63 have the same center, not offset centers. The spherical enclosure 63 does not form a hyperspheroidal hollow lens as in the claimed invention, and as seen by the arrows in Fig. 6b, directs light in an almost spherical pattern. Consequently, the enclosure 63 in Tarsa does not direct light in a given direction as efficiently as can be obtained in the claimed invention.

Accordingly, Claims 16-23 and 47-54, as amended, are not obvious in view of Son, Sakata and Tarsa, since none of the references, either alone or in any combination, teach or suggest "a hyperspheroid hollow lens having an optical axis, the hollow lens for collecting the light emitted from the first light source and directing the light in a first beam of light to the display device", and "the hollow lens having a substantially spherical interior portion and an outer surface bulging forward along the optical axis relative to the substantially spherical interior portion," as recited in base Claim 16, as amended, and similarly in Claim 47, as amended, or a

hollow lens with "spherically shaped inner and outer surfaces with centers offset from each other", as recited in Claim 20, as amended, and similarly in Claim 51, as amended. Therefore, Claims 16-23 and 47-54, as amended, are in condition for allowance. Reconsideration is respectfully requested.

Hirata discloses in Figs. 3 and 4, a display in which light from a light source La1, is directed through filter F1, polarized beam splitter PBS, microlens arrays MLA and MLB, element FL1, mirrors M1 and M2, dichroic mirrors DM1, DM2 and DM3, element FL12, polarizers 8a and 8b, LCD 7, and projection lens 12. Hirata does not have a hollow lens, such as a hollow hyperspheroidal lens as in the claimed invention.

Accordingly, Claims 24-31 and 55-62 are not obvious in view of Son, Sakata, Tarsa and Hirata since none of the references, either alone or in combination, teach or suggest "a hyperspheroid hollow lens having an optical axis, the hollow lens for collecting the light emitted from the first light source and directing the light in a first beam of light to the display device", and "the hollow lens having a substantially spherical interior portion and an outer surface bulging forward along the optical axis relative to the substantially spherical interior portion," as recited in base Claim 16, as amended, and similarly in base Claim 47, as amended. Therefore, Claims 24-31 and 55-62 are in condition for allowance. Reconsideration is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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Date: April 30, 2007